

South Lake Water Summit

**Thursday, Nov. 21, 2013
Clermont City Hall**

Michael Perry
Lake County Water Authority




Clermont Chain of Lakes



Clermont Chain of Lakes

Topics affecting Lake Levels

- **Surface Water Flow/Hydrology**
 - **Groundwater**
 - **Rainfall**
 - **Direct Human Influences**
 - **Environmental**
- 

Clermont Chain of Lakes

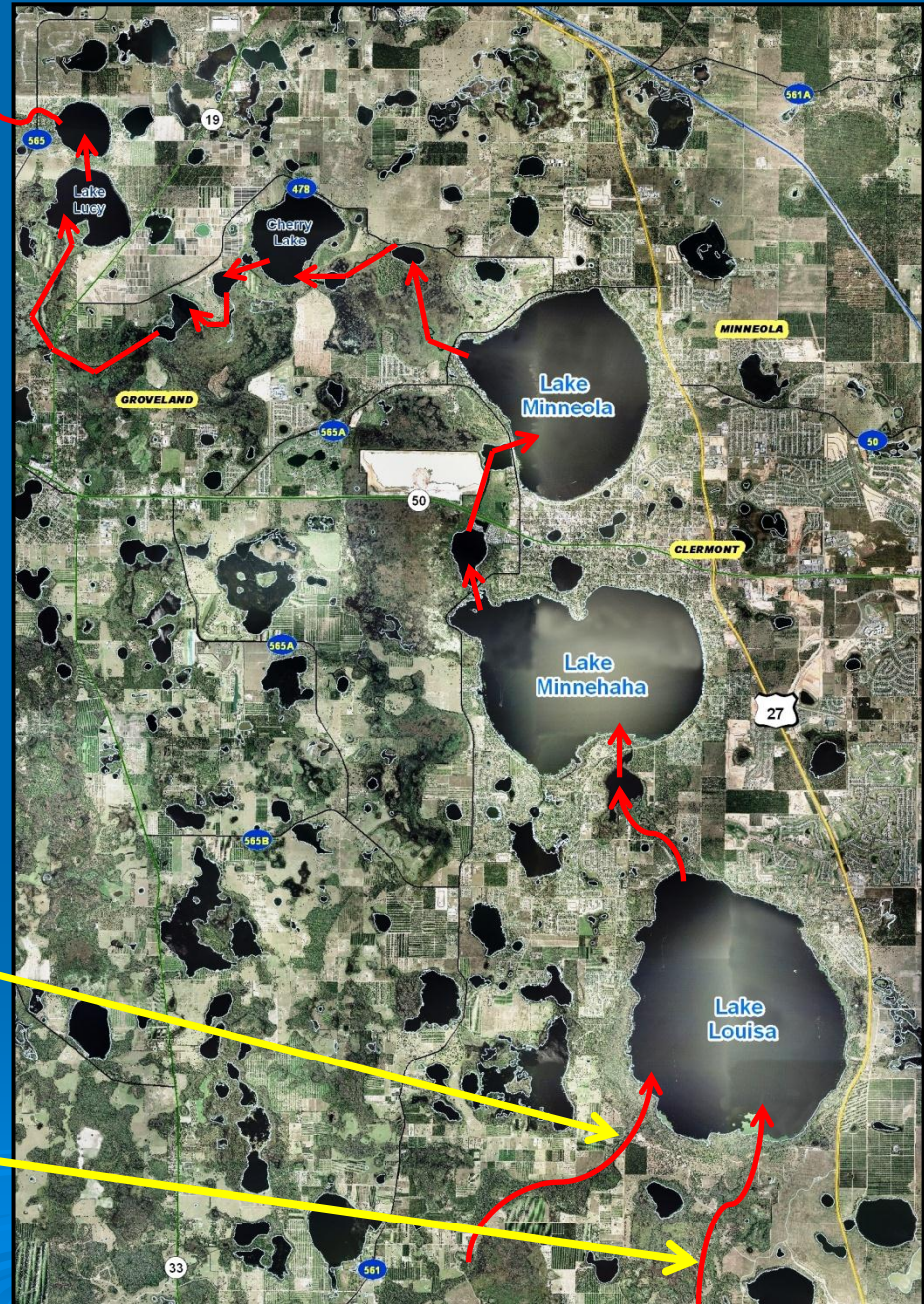
Hydrology



The Clermont Chain Flow Path

Little Creek

Big Creek



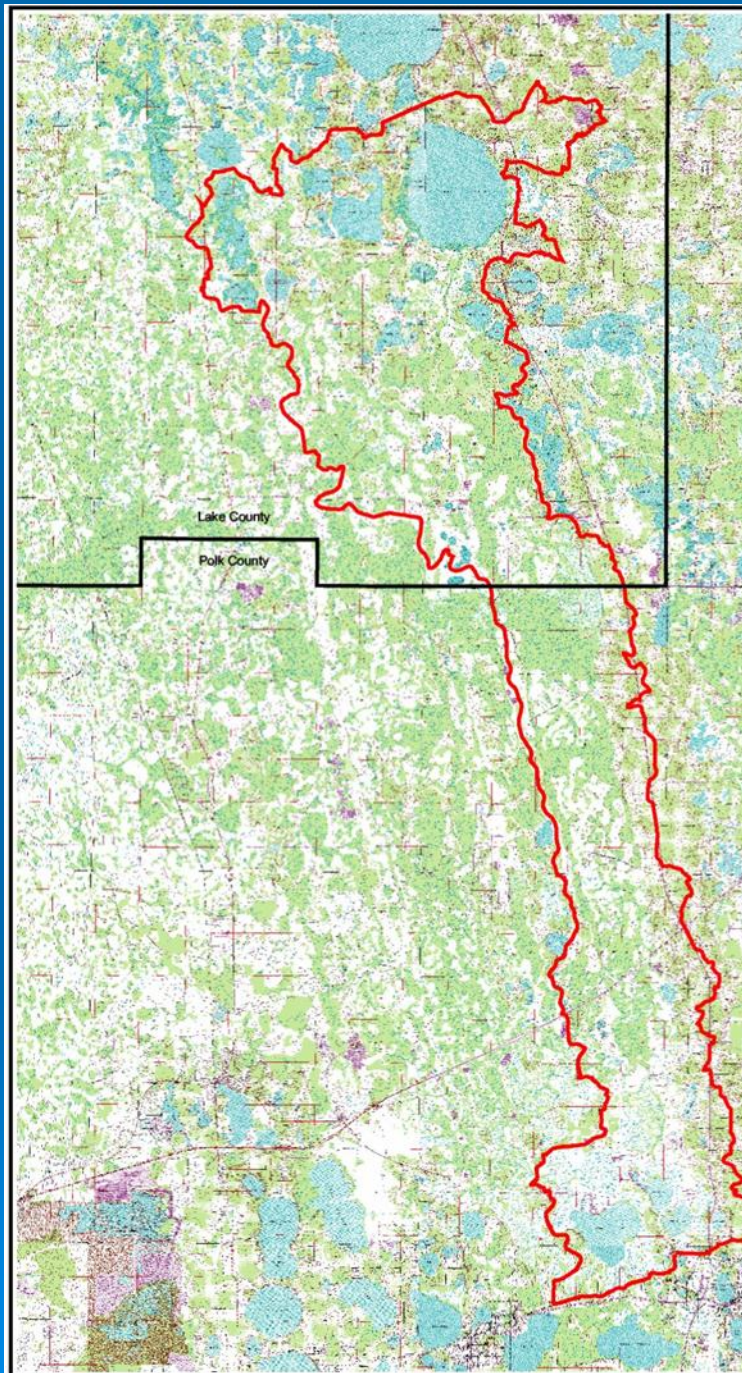
Major Drainage Basin From Polk to Lake County



0 3 Miles



LCWA
Lake County
WATER AUTHORITY



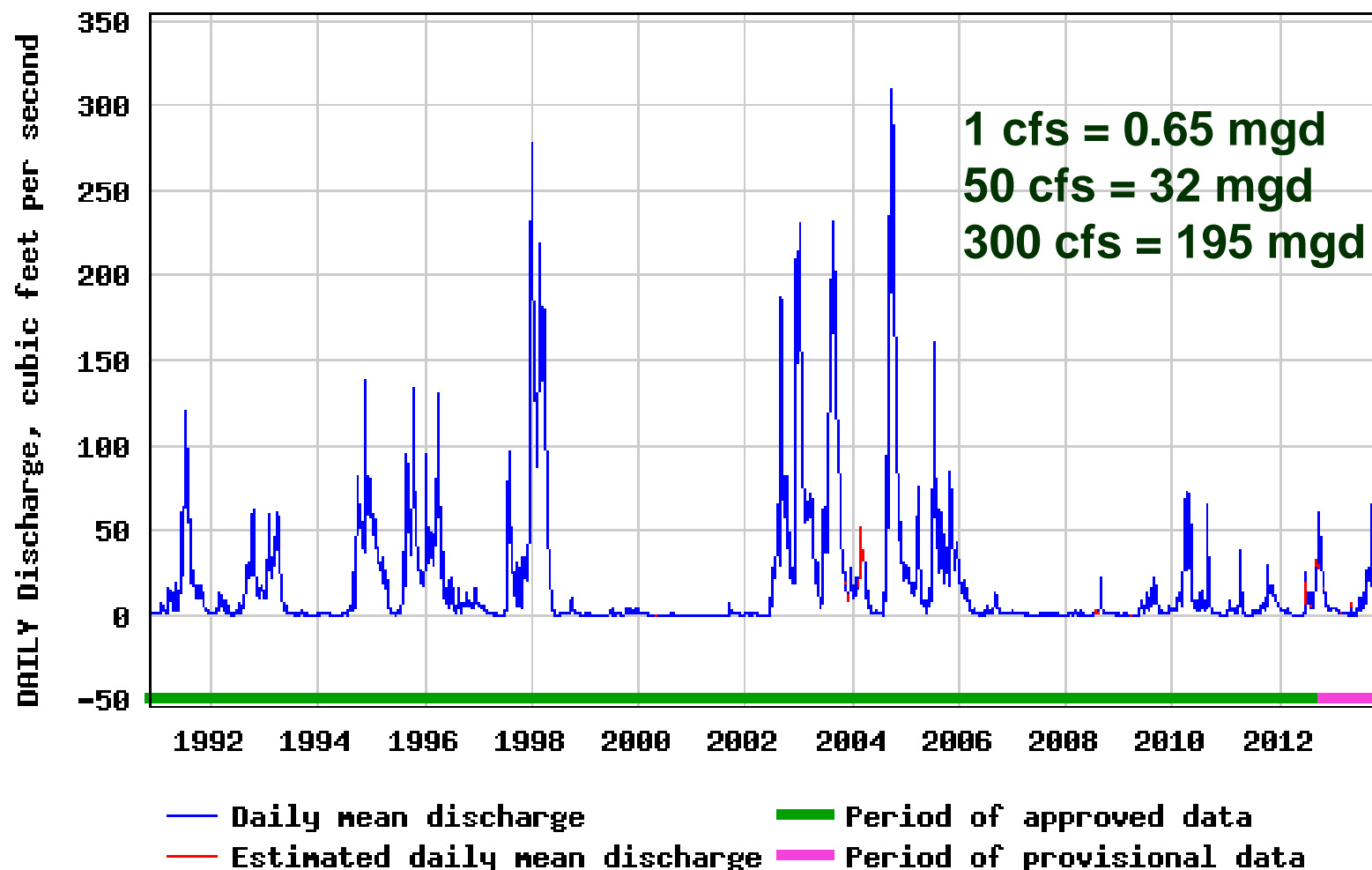
Big Creek Basin

- Confined on the east by the Lake Wales Ridge and on the west by a series of low parallel ridges
- Drains into Lake Louisa
- The average channel slope south of 474 is 0.6 ft./mile





USGS 02236500 BIG CREEK NEAR CLERMONT, FL



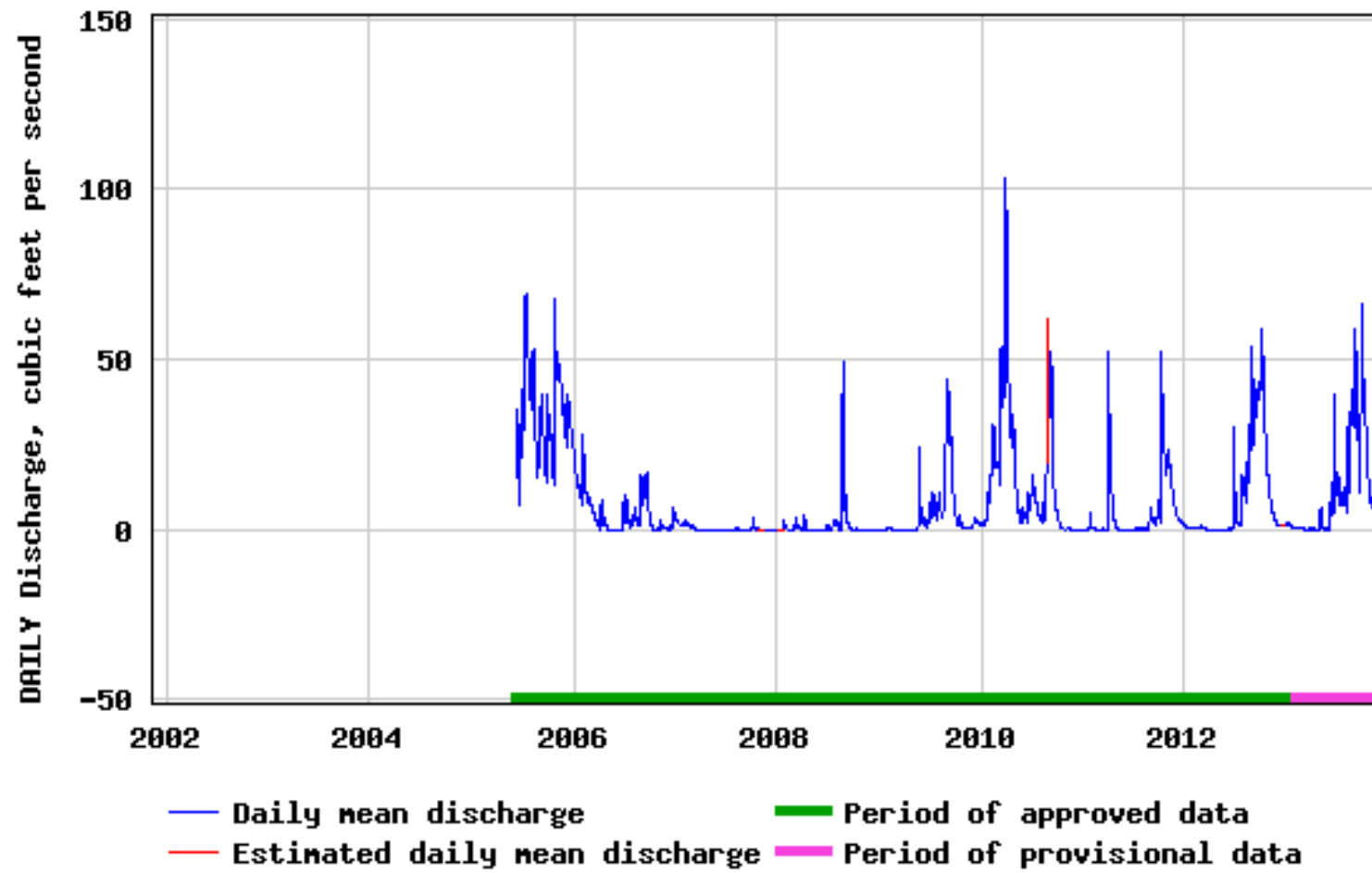


Little Creek Basin

- Empties into Lake Louisa
- Confined on the west by a series of low parallel ridges
- Also flat
- Smaller basin, drains faster to Lake Louisa than Big Creek



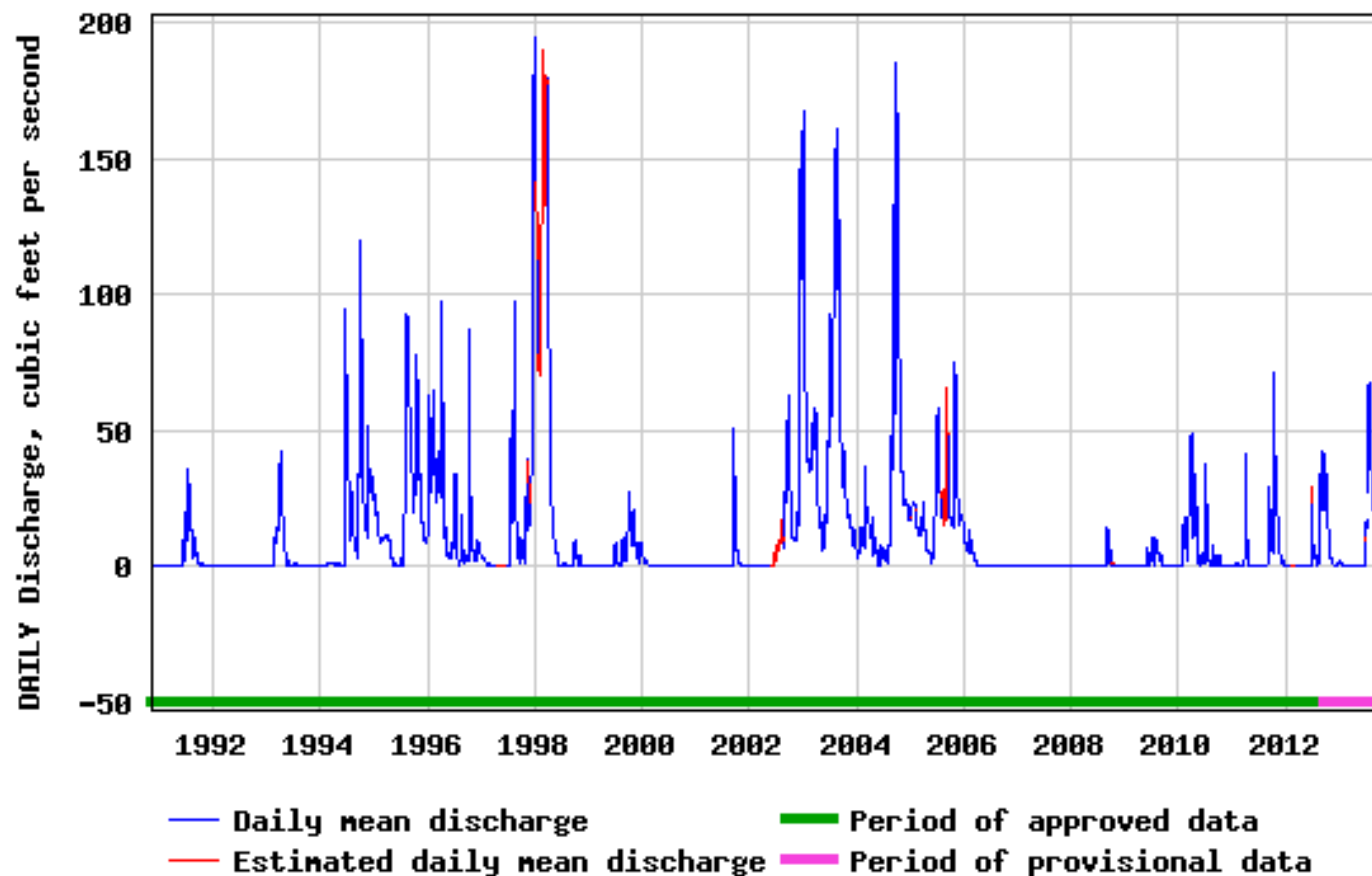
USGS 02236605 LITTLE CREEK AT GREEN SWAMP ROAD NEAR CLERMONT, FL



Other Contributing Basins

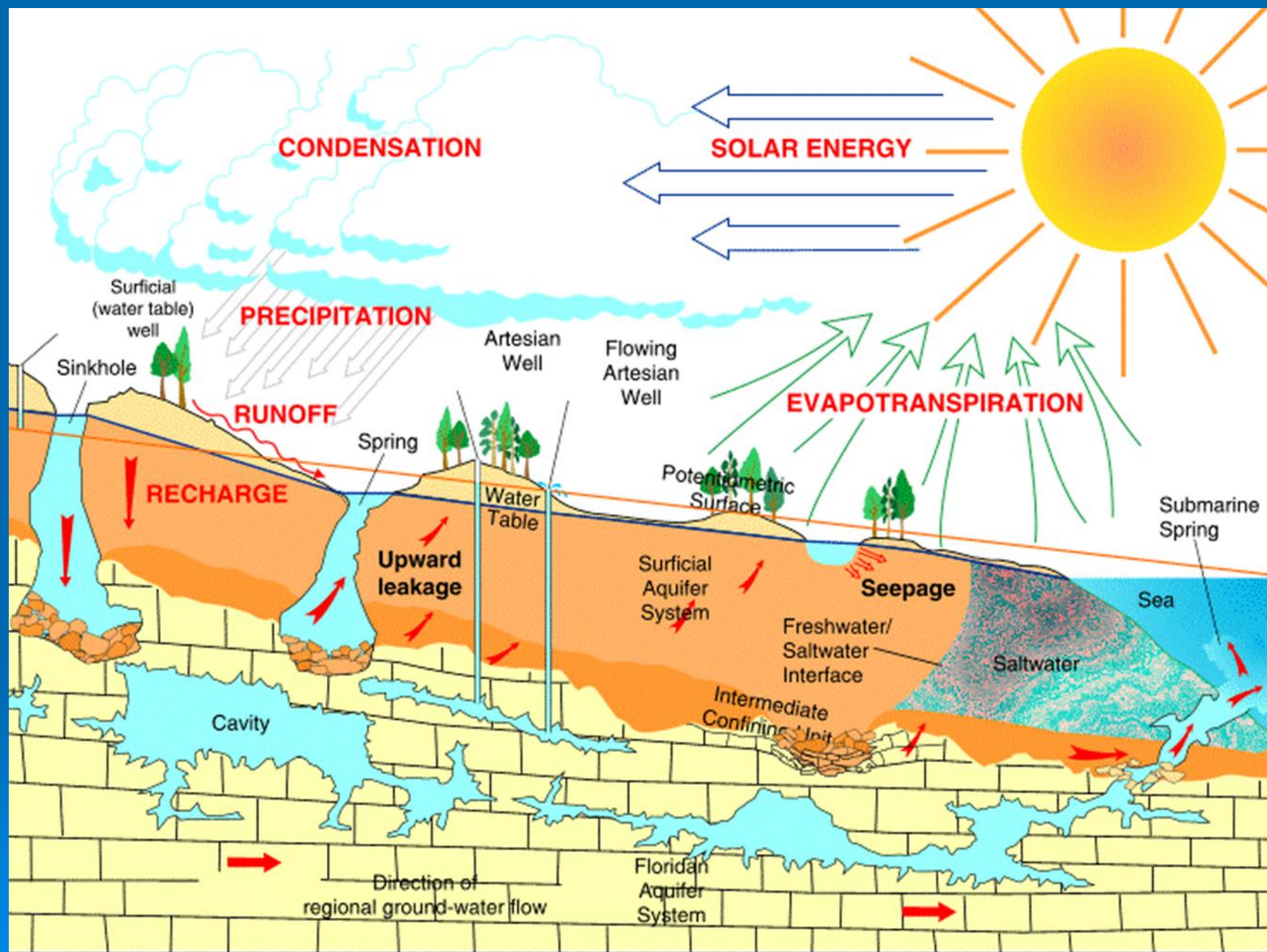


USGS 02236350 GREEN SWAMP RUN NEAR EVA, FL

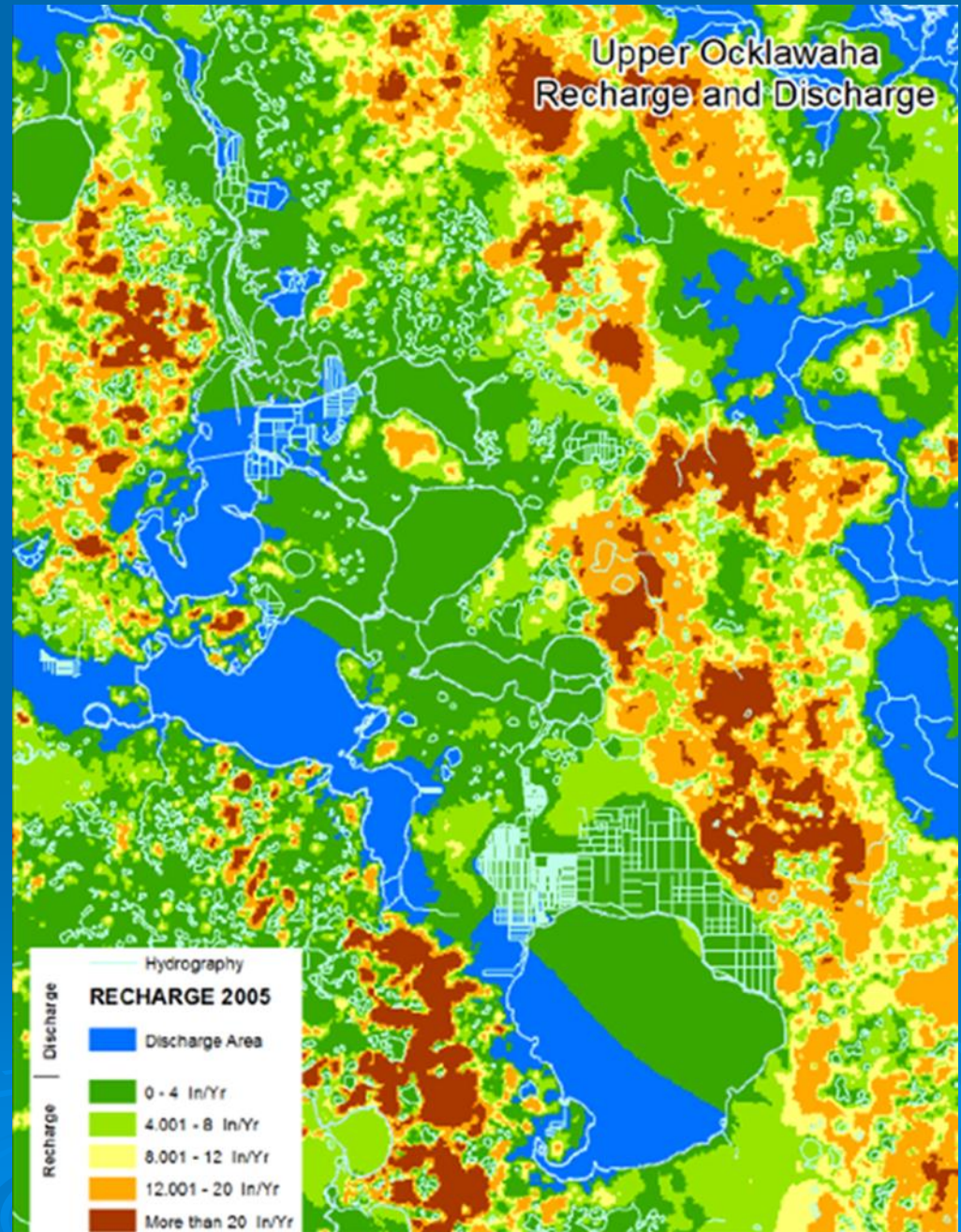


Groundwater Influence on Lake Levels





Recharge and Discharge Rates Between Groundwater and Surface Water

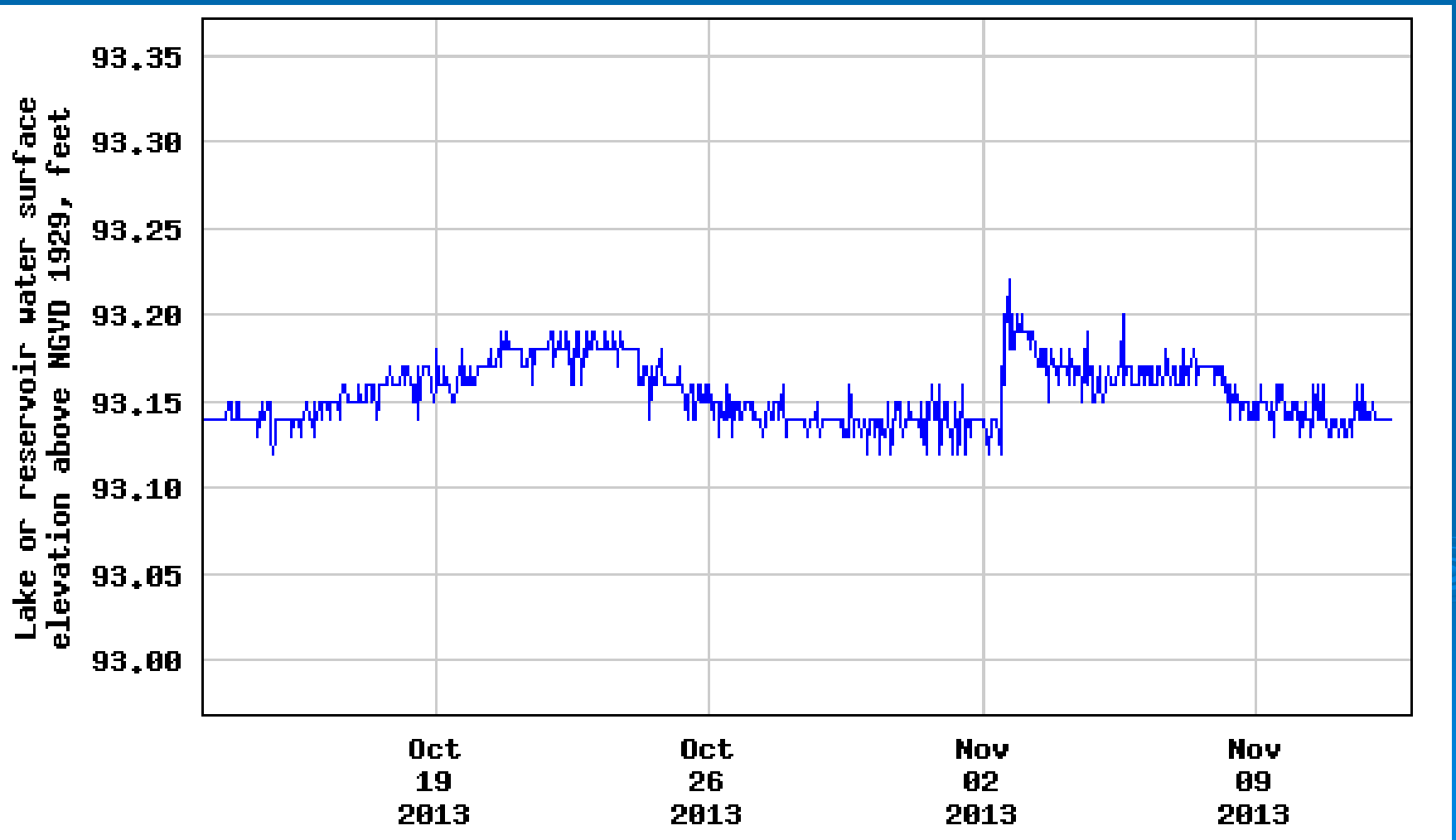


Recent and Historic Lake Levels



USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

Previous 30 days



USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

Past 6 months



USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

Past year



USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

Past 5 years



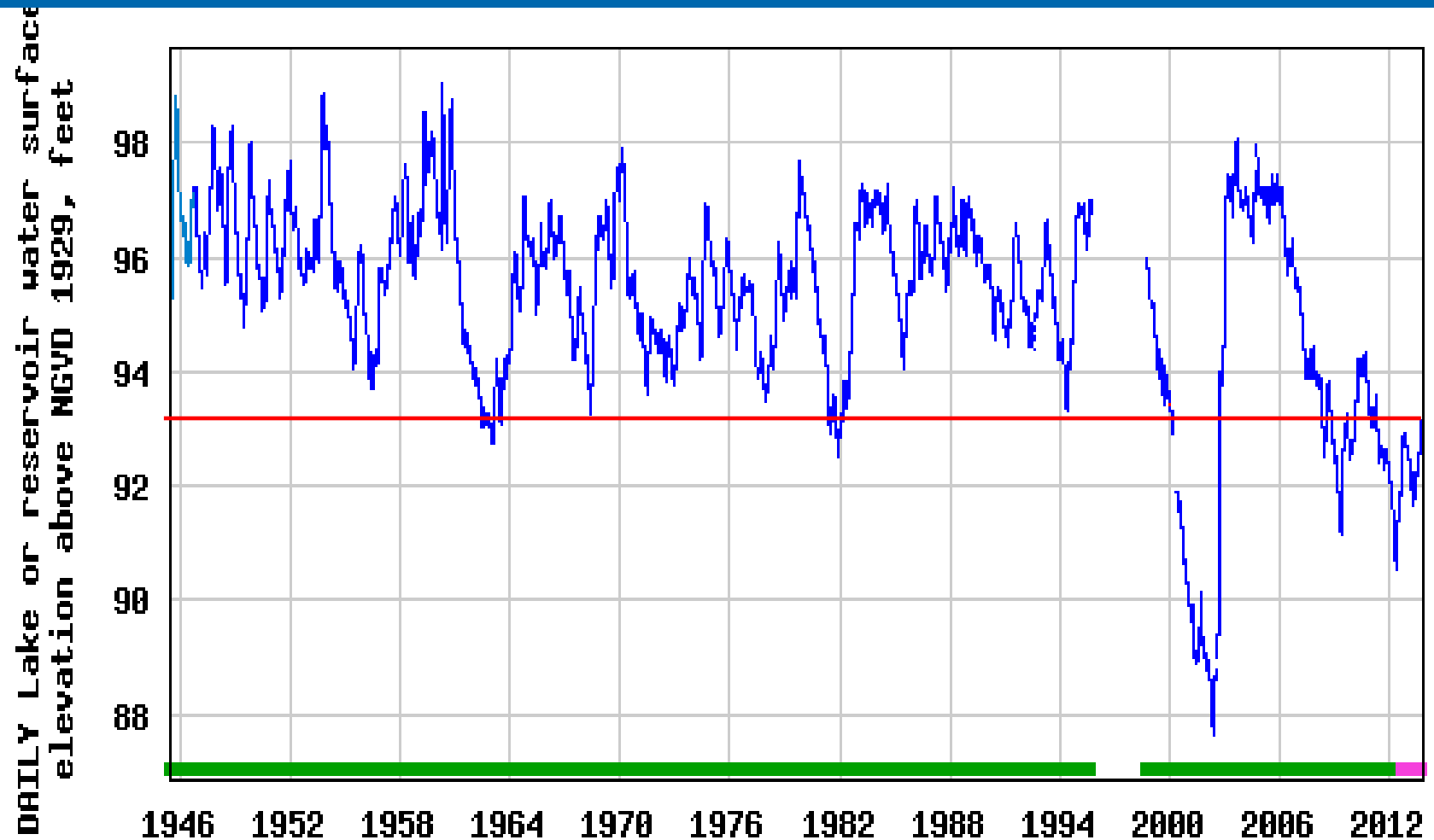
USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

Past 12 years



USGS 02236840 LAKE MINNEHAHA AT CLERMONT, FL

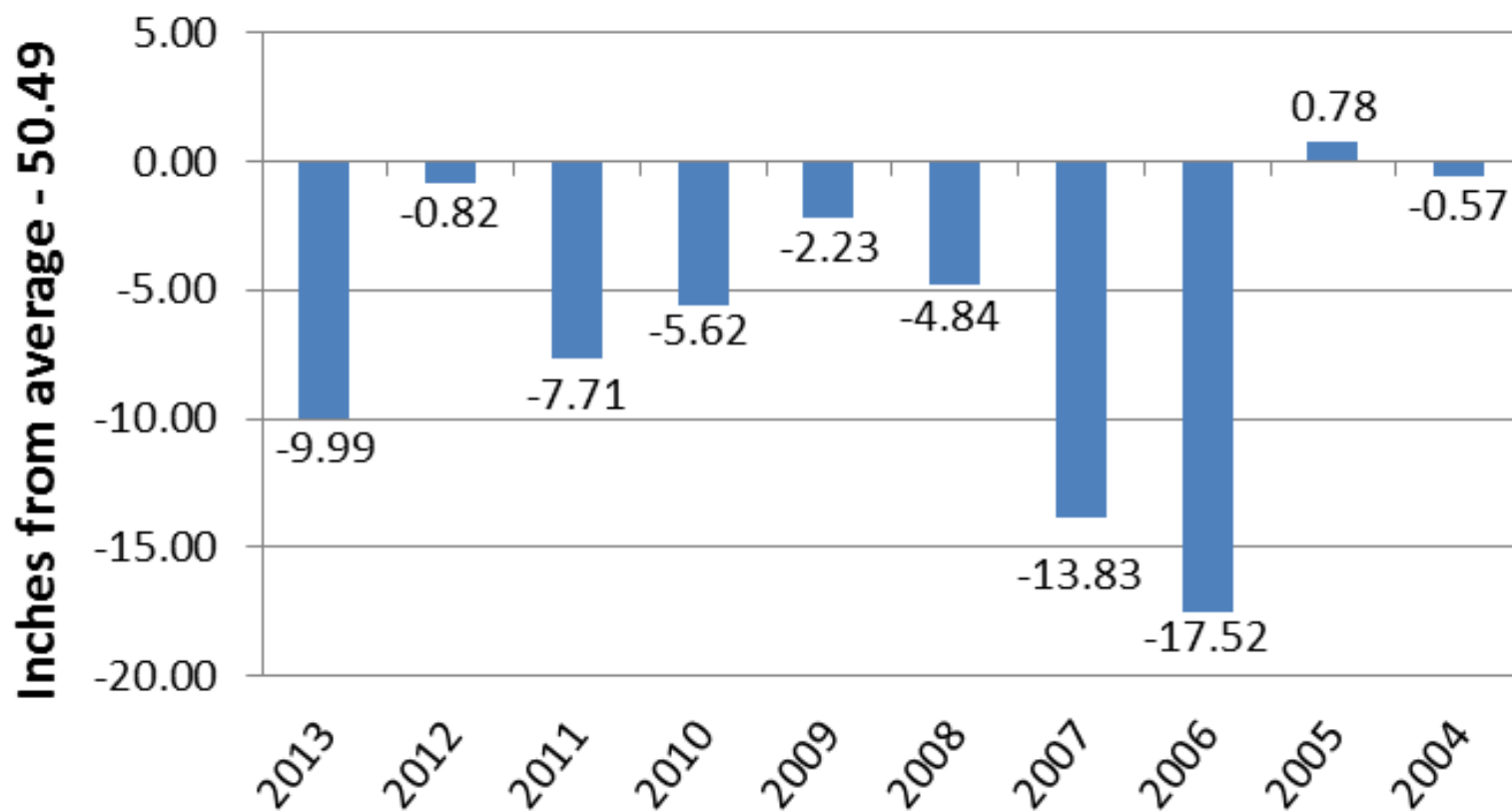
Period of Record



Rainfall



Lake County Rainfall Surplus/Deficit



Lake County Rainfall Surplus/Deficit as of October 2013

Year	474	Brown Shinn Road	Villa City	M-1	Emeralda	Tavares	YTD Rainfall	Historic Average	Surplus/ Deficit	Percent YTD Rainfall
2013							36.41	46.40	-9.99	78.47%
2012	4.35	11.61	8.99	-7.41	-12.41	-10.05	49.67	50.49	-0.82	98.38%
2011	-5.31	-4.80	-9.25	-6.83	-16.84	-10.47	42.78	50.49	-7.71	84.73%
2010	-6.23	-1.14	-4.82	-6.35	-8.80	-6.40	44.87	50.49	-5.62	88.87%
2009	-5.65	-0.21	-3.87	-5.83	-2.33	4.52	48.26	50.49	-2.23	95.58%
2008	-2.78	-4.62	-8.17	-5.09	-1.81	0.18	45.65	50.49	-4.84	90.41%
2007	-18.88	-21.82	-12.69	-9.42	-10.65	-12.62	36.66	50.49	-13.83	72.61%
2006	-12.39	-14.79	-17.95	-19.70	-17.27	-23.06	32.97	50.49	-17.52	65.30%
2005	3.50	1.59	-10.96	3.99	11.04	3.36	51.27	50.49	0.78	101.54%
2004	12.54	4.59	-5.39	-1.66	-3.37	-4.75	49.92	50.49	-0.57	98.87%
Average:	-3.43	-3.29	-7.12	-6.48	-6.94	-6.16	44.05	50.49	-6.24	87.24%

Cumulative Rainfall Deficit: - 62.35 inches
- 5.20 feet

Lake County Rainfall Surplus/Deficit

12 Month Running Total (Oct-Oct)

Annual average 50.49 in.

Location	October 2013 (inches)	12 Month RunningTotal	12 Month Surplus/Deficit
474	1.28	37.23	- 13.26
Brown Shinn Road	1.42	37.97	- 12.52
Villa City	0.38	42.31	- 8.18
M-1	0.62	37.07	- 13.42
Emeralda	0.40	30.02	- 20.47
Tavares	0.21	42.12	- 8.37

Green Swamp Rain Gages

Hwy 474

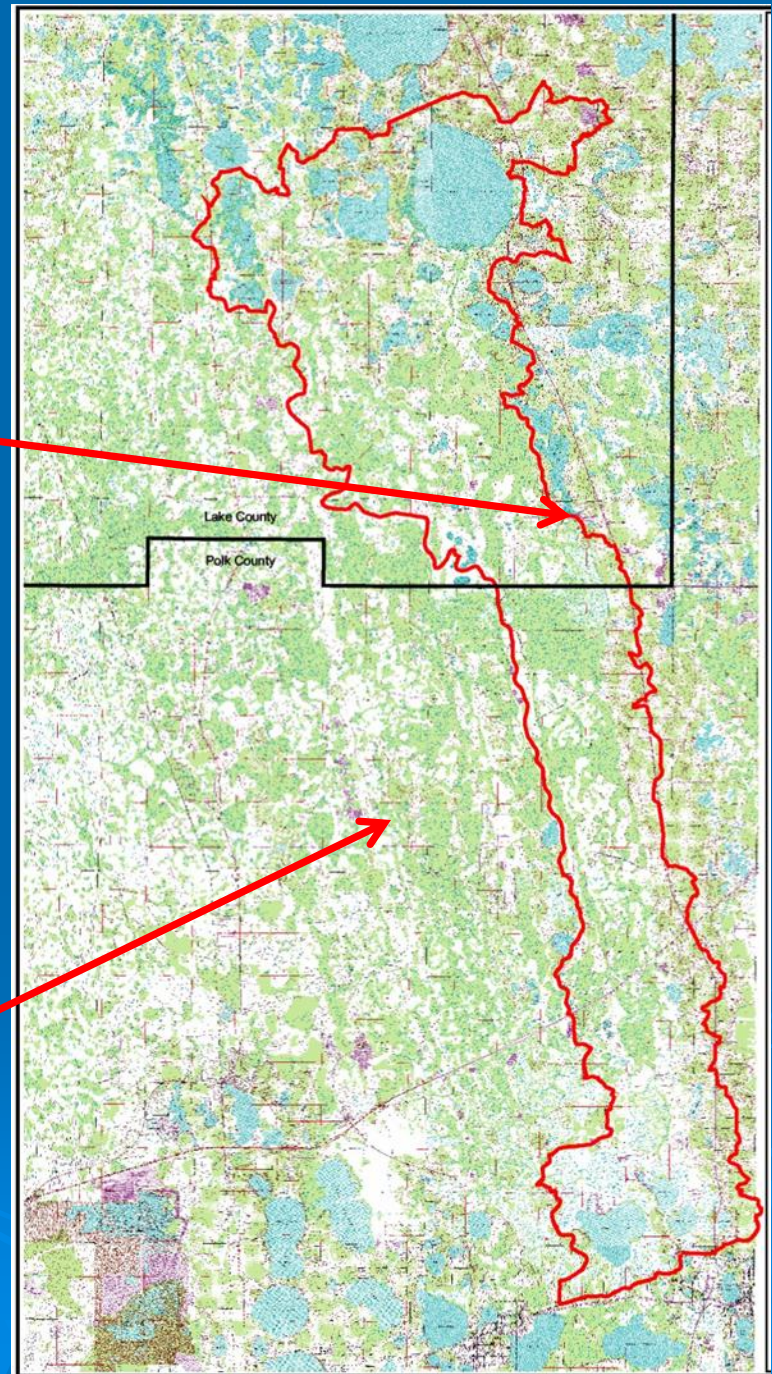
Date	Rainfall	Surplus/(Deficit)
2006	37.01 in.	(13.49)
2007	30.46 in.	(20.04)
2008	47.93 in.	(2.57)
2009	44.84 in.	(5.66)
2010	44.88 in.	(5.62)
2011	45.18 in.	(5.31)
2012	54.84 in.	4.35
2013	37.23 in.	(13.26)

Total cumulative deficit = 61.60 in.

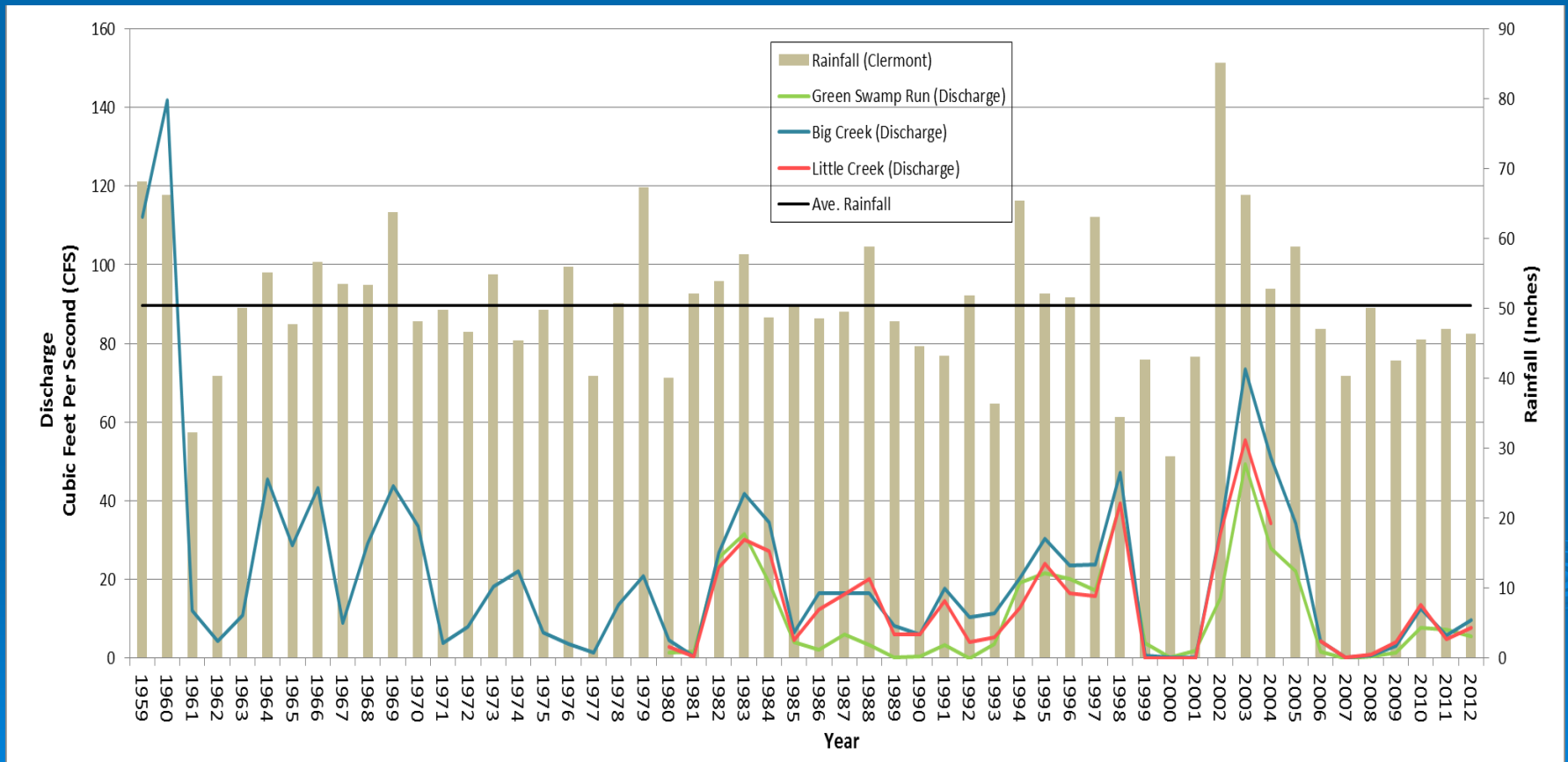
Brown Shinn

Date	Rainfall	Surplus/(Deficit)
2006	37.99 in.	(12.51)
2007	28.29 in.	(22.21)
2008	45.76 in.	(4.74)
2009	49.07 in.	(1.43)
2010	48.36 in.	(2.14)
2011	45.69 in.	(4.80)
2012	62.10 in.	11.61
2013	37.97 in.	(-12.52)

Total cumulative deficit = 48.74 in.



Mean Annual Rainfall and Basin Discharge



Lake Minneola, north shore, 6/10/2002



Lake Louisa

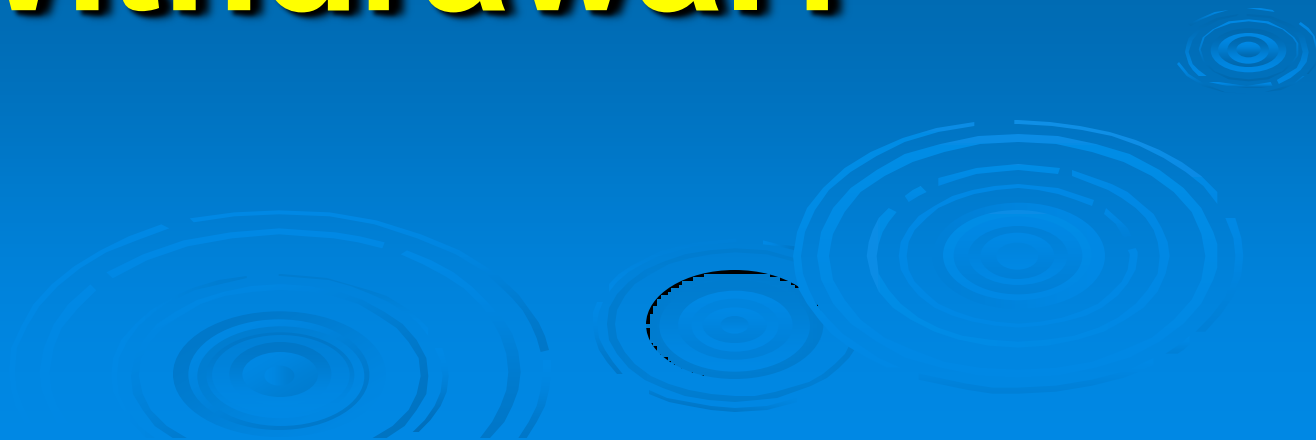


Lake Louisa, 6/7/2002



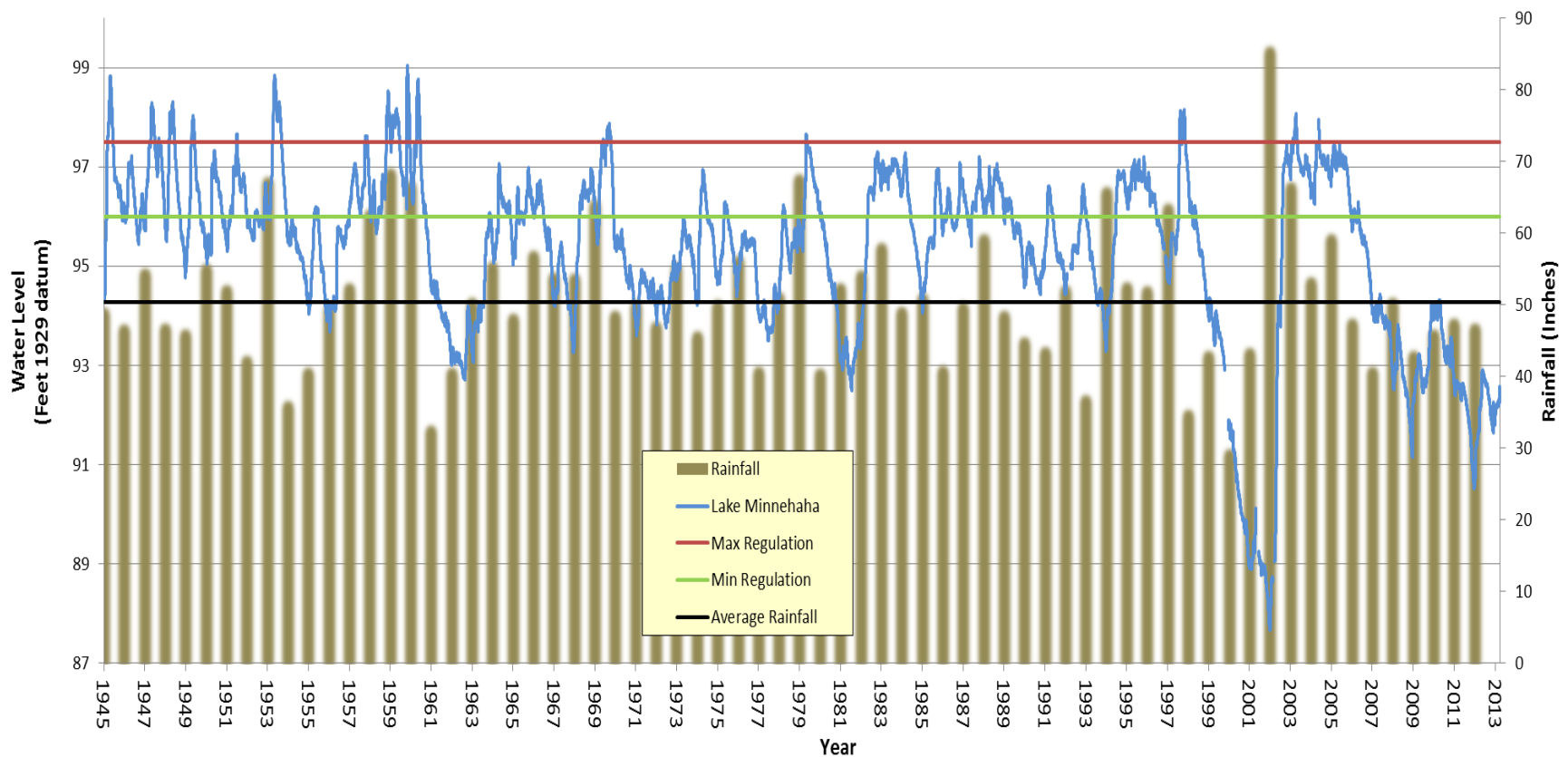
Lake Louisa, 9/15/2002

Lack of Rainfall or Withdrawal?



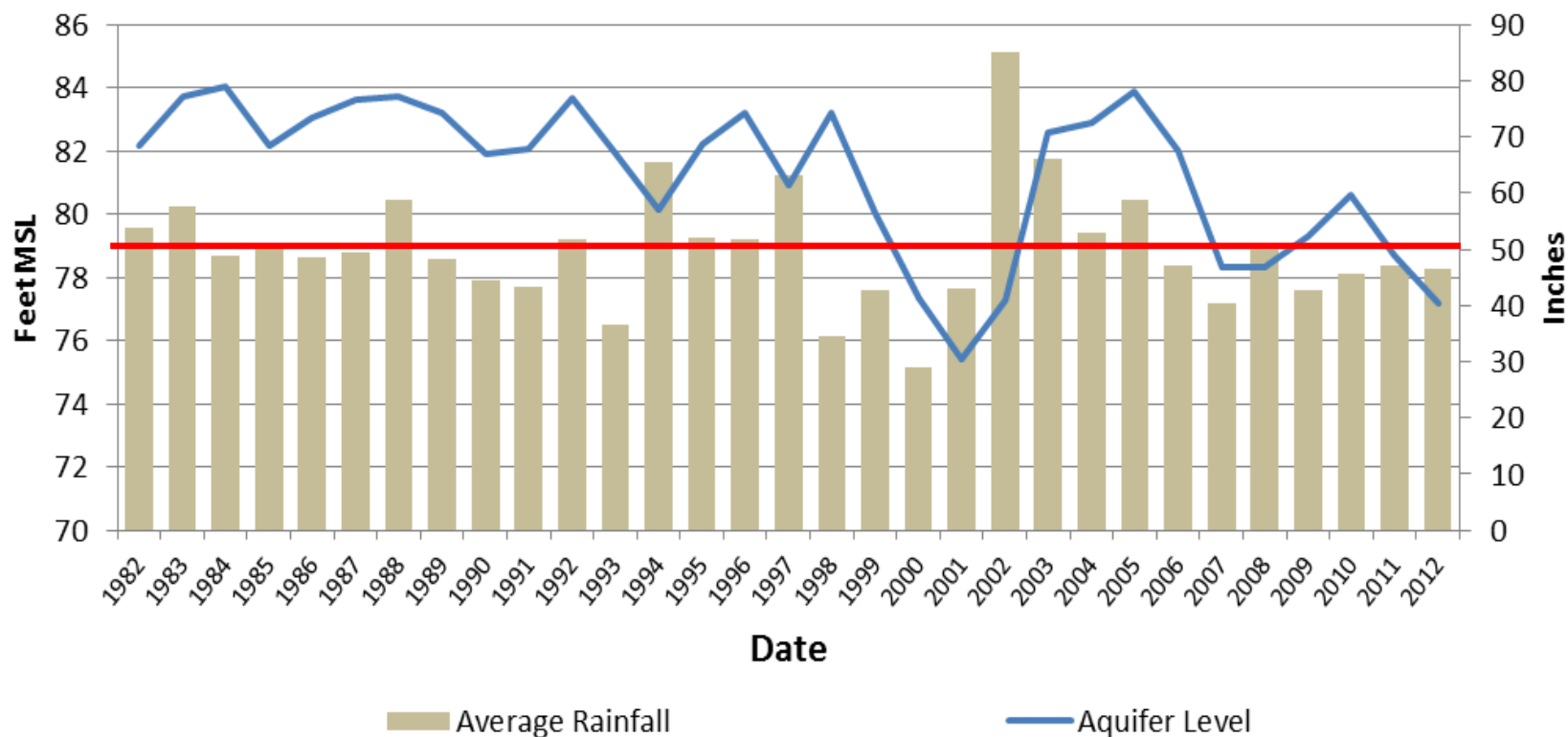
Lake Minnehaha

Lake Levels and Annual Rainfall 1945-2013



Average Monthly Elevations and Annual Rainfall

SJRWMD Floridan Aquifer Well Near Lake Minnehaha



Modeling Results

- Work performed by Devo Engineering in 2003 for the LCWA states that “four percent of the lake level declined could be explained by anything other than lack of rain.”
- SJRWMD CFWI model reports that 5-15 percent of a lake level decline (depending on the lake) is due to something other than rainfall.

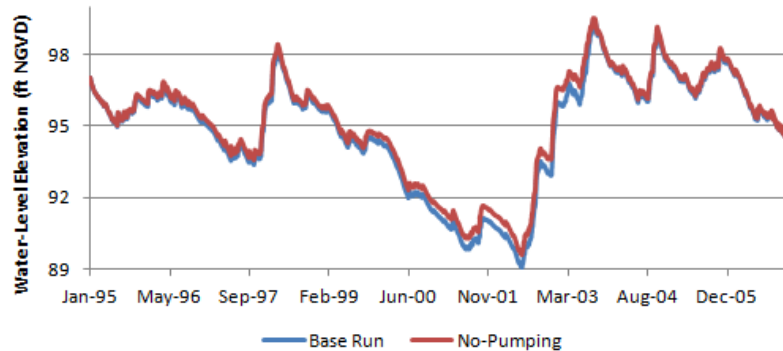
Modeling Results

A 2013 modeling effort by AMEC states that:

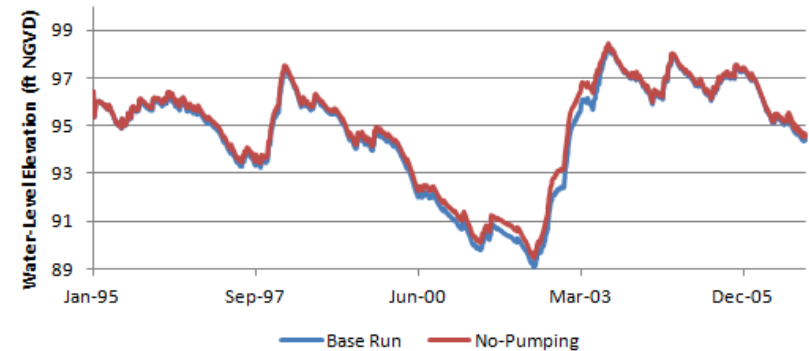
- Groundwater withdrawals as-a-whole do not seem to have significant impact on the lake levels
- Rainfall seems to be the dominant factor controlling the lake-levels
- The contributions from Big Creek and Little Creek are critical for lake levels to rebound.

AMEC Model - No Pumping

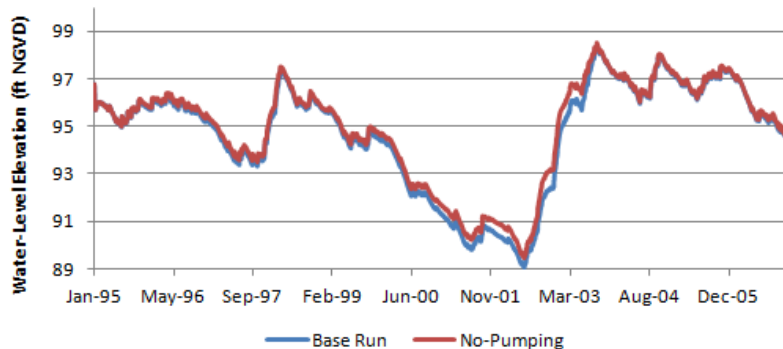
Lake Louisa - Base and No-Pumping



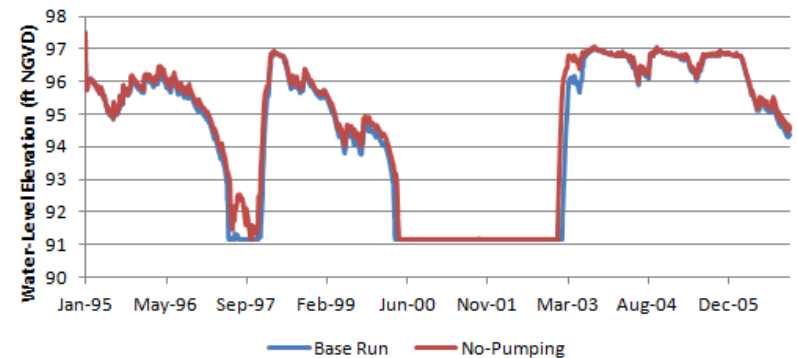
Lake Minneola - Base and No-Pumping



Lake Minnehaha - Base and No-Pumping



Lake Cherry - Base and No-Pumping



Historic Flow Alterations and Restoration Activities



Cherry Lake Structure



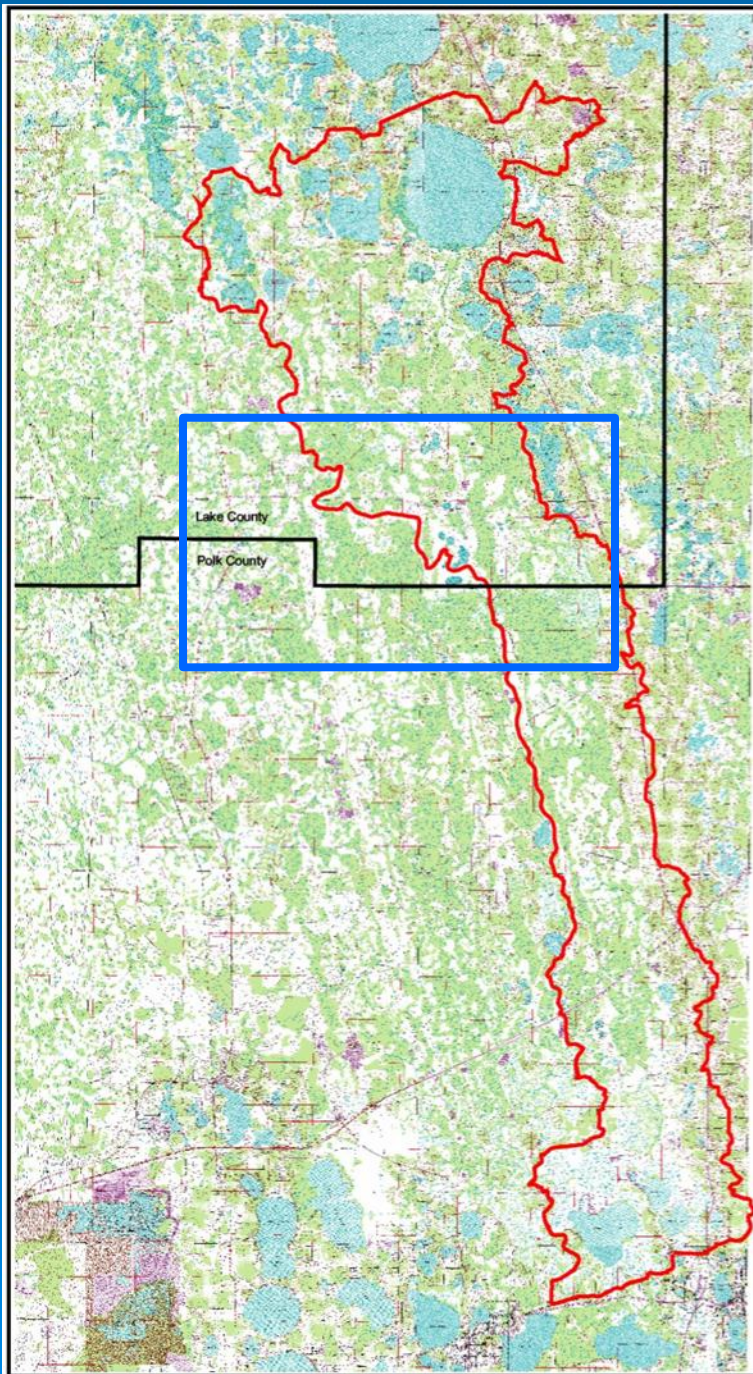
Lake Lowrey



Major Drainage
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South Lake Historic Flow Restoration



- Improvements to Culverts within Little Creek Basin
- Restore Historical Flows to Little Creek
- Revise an Existing Surfacewater/Groundwater Model

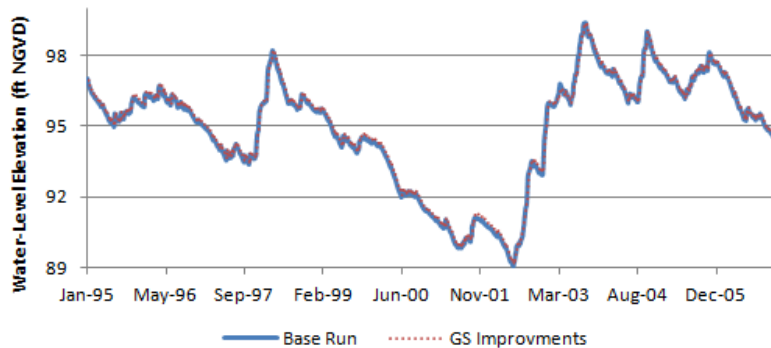
Culvert Data Collection Points in the Little and Big Creek Basins





Model Simulating All Green Swamp Improvements

Lake Louisa - Base and GS Improvments



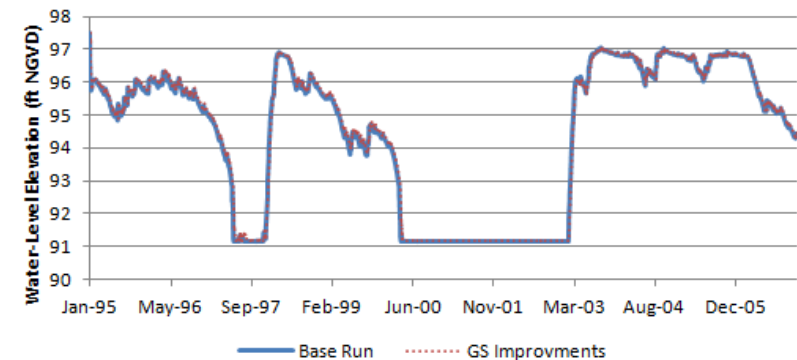
Lake Minneola - Base and GS Improvments



Lake Minnehaha - Base and GS Improv.



Lake Cherry - Base and GS Improvments



Other Influences on Lake Levels



Environmental Factors

Evapotranspiration

- Higher Temperatures
- Bright Sunshine
- Relatively Low Humidity

Can result in evaporation rates of up to $\frac{1}{4}$ inch per day

Direct Human Influences on Lake Levels

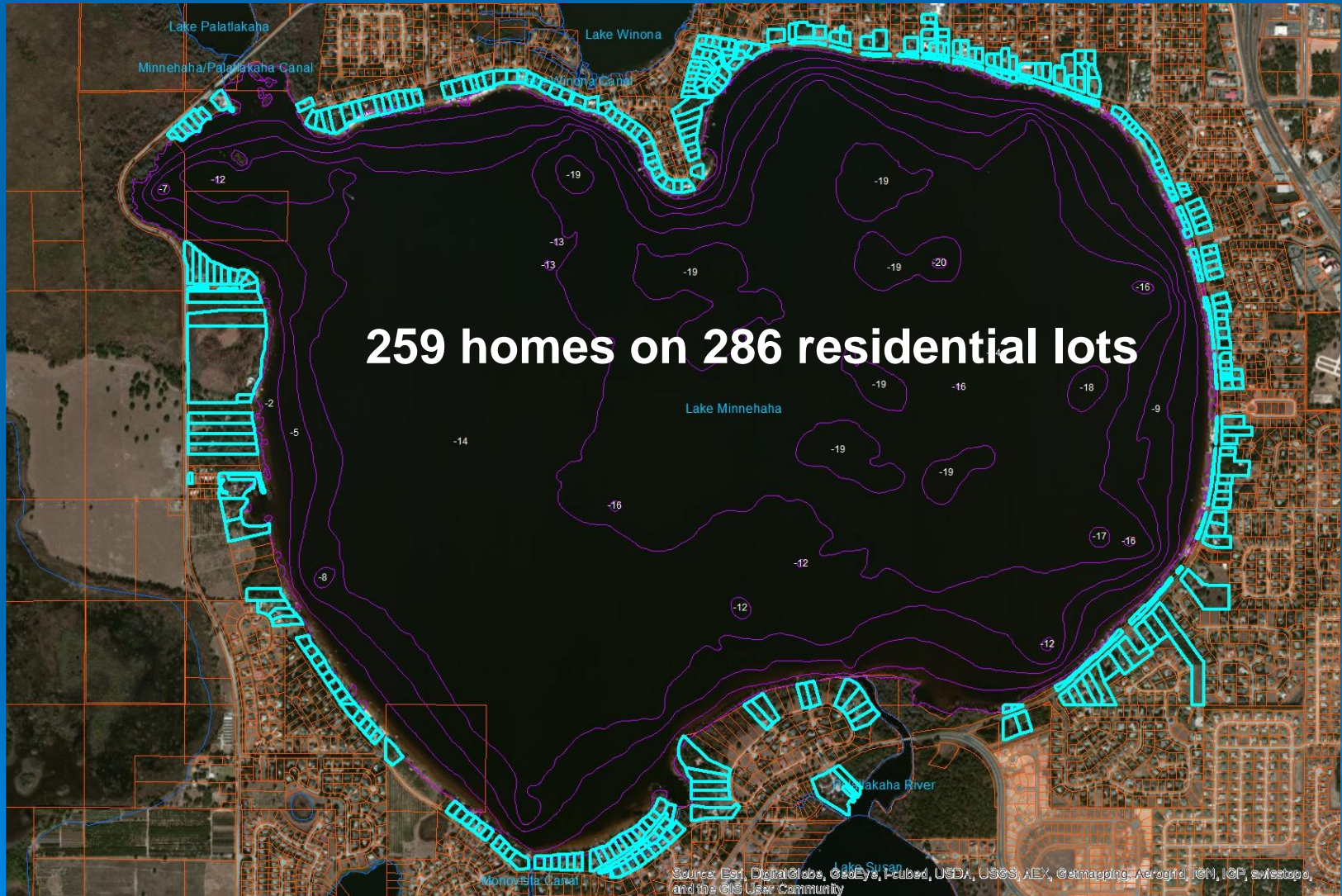


This topographic map depicts the Lake Minneha area, including surrounding lakes such as Lake Minneola, Lake Minneha, Lake Louisa, and Lake Nellie. The map features a grid with section numbers 27, 50, and 56. A red rectangular box highlights the study area, which is centered on Lake Minneha. The map includes a legend in the top right corner with the following items:

- Gauging Stations (indicated by a red circle with a cross)
- Floridians Wells (indicated by a yellow circle)
- NOAA Weather Station - Clermont 75 (indicated by a diamond symbol)

The map also includes a graphic scale (1 inch = 4,000 feet) and a north arrow. The Palatka River is shown flowing through the area, and the former sand mine is labeled near Lake Minneola. The map shows various roads, including US 27 and SR 50, and several smaller lakes and ponds in the region.

Residential Properties on Lake Minnehaha



Potential Water Use From In-lake Residential Irrigation

Avg. irrigation system - gpm	25		
Max. 1 hour (60 min) per zone	60	1,500	gph
Number of zones	5	7,500	gallons per irrigation day
Irrigating days per week	2	15,000	gallons per week
Each week all year	52	780,000	gallons per year
Residential homes	259	202,020,000	gallons used from Lake Minnehaha
Est. Percent Volume of Lake - 1.7%			

Summary

- Lake levels are influenced by surface water, groundwater, environmental and human factors
- Current groundwater withdrawals do not seem to have had a significant impact on the lake levels
- Rainfall seems to be the dominant factor controlling the lake-levels
- The contributions from Big Creek and Little Creek are critical for lake levels to rebound.
- The 2006 – 2013 drought has lasted for 7 years and is the 2nd worst ever recorded.

